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BY

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THE RATIONALE FOR COMPUTER-BASED TREATMENT OF LANGUAGE DIFFICULTIES IN NONSPEAKING AUTISTIC CHILDREN

No one person invented and developed the treatment method I shall describe. Hence let me first acknowledge my deep indebtedness to my co-workers at Stanford University- Horace Enea, David Smith, Malcolm Newey and Maxine Colby, each of whom has put years of effort into this project.

We began about seven years ago with a working hypothesis and two well-known facts. The hypothesis was that a nonspeaking autistic child's primary difficulty lay in an inability to process symbols, language being of course the most important symbolic system used in human communication. The first well-known fact indicated that prognosis was highly correlated with speech, the outlook for nonspeakers being poor. The second fact was the common observation that these children played for hours with machines while remaining indifferent to interactions with people.

There is now increasing evidence in the research literature supporting this hypotehsis of a primary difficulty in symbol processing. [Churchill,1972; Frith,1972; Hermelin and O'Connor,1970; Rutter, Bartak, and Newman,1971]. A dysphasic or aphasic child also has difficulty with language but he can acquire other symbolic

systems such as gesturing and drawing. He may even learn to read. But the nonspeaking autistic child has great difficulty with all symbolic processes, not just language.

The cause of this condition remains unknown. Nowadays few experts in the field defend a psychogenic etiology since the supporting evidence is weak and the disconfirming evidence is gaining in strength [Rutter,et al,1971]. Regardless of the original cause, if we believe we understand the crux of the child's difficulty, we can try to devise a remedial treatment which takes advantage of child's fascination with machines. Our idea then was to create a machine a nonspeaking child could play with which would involve the use of language skills.

The system we developed consists of a television-like screen and a TYPEWRITER-like keyboard in front of which a child sits or stands. There is no computer is sight since it is located in another part of the building. Pressing the keys on the keyboard causes symbols to appear on the screen accompanied by sounds of human voices and other noises common in a child's life. It is much like having your own Sesame Street to play with. But rather than being a passive recipient of the television show, a child in our situation is an active initiating agent controlling the machine. Instead of having things done to him, things are done by him. The merits of the machine are that it is untiring, predictable, always saying the same thing the same way, never angry, never bored and controllable-

properties which are notoriously lacking in humans. This audio-visual-tactile experience is provided by a computer program running on a PDP-6/10 time-shared system in the Stanford Artificial Intelligence Laboratory. The program is divided into games intended to give the child a variety of opportunities for playing with and interacting with symbols. For example, in one game, when a child presses the key showing the letter H, an H appears on the screen and a voice says "H". In another game pressing the key labelled "H" produces a running horse on the screen accompanied by the sound of horse's hoofs. There exist over 1000 such experiences on the system. The games are organized at various levels of complexity and are designed to show a child how English is put together from sounds and letters into words and expressions. The idea is that in playing with the machine he will begin to copy or approximate the sounds he hears associated with what he sees on the screen. I shall not go into the details of the games here. They are throughly described in the literature. [Colby and Smith, 1971]. Instead I shall try to sketch the rationale or major principles underlying this approach.

First, consider how normal children acquire language. They are not taught formally as are adults learning a second language. Children are simply exposed to members of a linguistic community. They are given an opportunity to explore language usage in everyday communication between themselves and other humans who encourage and correct. From this exposure, exploration and corrective feedback they come to associate the sounds and meanings of words. They come to

sense that certain sounds, human voice sounds, are not just sounds in themselves like the wind in the trees, but that they are about something else, that is, they are symbolic. Between the ages of roughly 2 months and 4 years normal children spend thousands of hours listening, practicing and playing with language. Mastery of a language, (getting most of it right) does not come until far into adolescence, if ever. A normal child can make an interpretation of expressions he has never heard before. A nonspeaking autistic child does not show this course of development.

The problem is not simply the development of language skills but also the acquisition of concepts necessary for a comprehensive enough model of how the world works, especially the human world. The conceptual or cognitive deficits shown by nonspeaking autistic children involve those concepts which are normally acquired through language or other symbolizations. Take the abstract concept of 'danger'. To prevent a child from becoming hurt, a parent must identify certain concrete objects and situations as dangerous until the child grasps the abstract concept of danger. All this is done linguistically and through pointing. By way of language , objects and situations can be referred to and warned about even when they are not present, and referred to without pointing when they are present. An important socializing function of language is to mark off for a child what to pay attention to and what is to be done and not done. Many of the characteristics of autistic children, for example, the lack of empathy, can be viewed as a consequence of an inability to form

regular conceptual patterns about the world because the necessary concepts acquired through language are missing. As one perceptive mother said about her autistic child,' a screw is not loose , a screw is missing',

A poorly developed ability to process symbols has further consequences besides conceptual deficits. Without language a human has no awareness of being aware. He lacks the ability to self-monitor and to self-control by talking to himself. He cannot use symbols reflexively, that is, to give himself orders and to comment on himself to himself. Having language a normal child comes to realize the self is really two which can talk to one another. Finally, to become a person one must be recognized as a person by other people who treat you as if you had self-awareness and self-control. This recognition is virtually impossible for a child without language skills and probably represents the greatest tragedy in his life.

Thus far I have spoken of autistic children as if the nosological label stood for a single homogeneous group. Thirty years ago it seemed that might be the case. Now it appears as if there exist several autistic syndromes, none of which should be confused with childhood schizophrenia since they differ in onset, course, symptoms, family history and prognosis. There are speaking and nonspeaking autistic children. Among the nonspeaking group there are those whose linguistic development is normal until sometime in the second year when they lose their language abilities. The other major

group are those children who, from the start, have trouble with language, understanding little and saying even less, perhaps one 'mama' or 'no' a year. In our experience the most difficult problem for differential diagnosis lies in deciding whether a nonspeaking child suffers from dysphasia (developmental aphasia), autism or perhaps both. Over time the correct diagnosis can be made when it becomes clear that the dysphasic child can mimic, draw pictures and signify greetings while the autistic child cannot.

Taking a cue from the normal child who treats language as a toy, our first principle was that the treatment should provide an opportunity for exploratory play. The treatment situation is not one of forced drill, instruction or training but one of play with the keyboard and video display. Operant conditioning methods reward the child with candy or food for his actions. We do not, believing that food rewards inhibit exploratory curiosity, as has been shown in animals both by Harlow and Nissen. From our own experience and that of workers in computer-aided instruction, we have learned that food rewards are distracting and disrupting. Exploratory learning requires a situation which invites exploration, and provides time, security and minimal interference by adults.

In each of the sessions the child has a 'sitter', an adult whose main task is to sit and not interfere. The sitter's task is difficult, especially if he has been trained to DO things. We want to give the child an opportunity to freely self-select those symbols

which interest him, rather than tc have an adult instruct him or quiz him about those symbols which he 'should' learn. The sitter's behavior is crucial to this treatment method if the spirit of play rather than drill is to be provided. Of course the sitter offers social approval and encouragement when it is fitting.

An ideal treatment session results when the child is in a good mood, is interested in working the keyboard display, enjoys imitating the sounds and is successful in getting the machine to do what he wants. The principle of success is important here because, in our view, many nonspeakers have given up on language. They have failed over and over and hence withdraw from trying. We do not let them fail. As one normal child said about the experience "it's fun, you can't lose". There are students of autism who consider nonspeaking autistic children to be innately withdrawn from people and hence not acquiring language. We feel it is the other way around; they have so much difficulty with language they withdraw from people who unwittingly flood and overwhelm them with meaningless noises. No wonder they do not call, address, ask or answer questions of these giants who spout gibberish. Autistic children are not aloof and indifferent to all people -- only to those who talk. I have often wondered if it is not eye-to-eye contact they avoid but eye-to-a-mouth which , as far as the child is concerned, simply jabbers. If you say little or nothing to a nonspeaking child on first meeting him, you will more than likely find him in your lap, as affectionate as any other child.

Another myth exists in the literature which I would like to dispel. Autistic children are said to show pronominal reversal, using the second person singular pronoun "you" for the first person singular pronoun "I", and "I" for "you". This is not so. It is the normal child who reverses or converts personal pronouns. The autistic child LACKS the rule for correct pronoun assignments and simply echoes what he has heard. Pronouns are examples of deixis in which the denotation of the words shift depending on the speech situation, in contrast to, for example, proper names whose denotations remain constant. The assignment rule for the variables "I" and "you" is that the speaker calls himself "I" and calls the listener "you". Young autistic children are ignorant of this rule, for normal children the rule is not actively taught by adults, but is somehow grasped by the normal child from the data of human dialogues. The autistic child, unable to process language, echoes back, in an untransformed and uninterpreted way, what is said to him. If you say to him "Do you want your jacket" he will echo it, failing to transform the pronouns. Everybody calls him "you" so he believes "you" must be one of his names. Due to the limitations of short-term memory, an autistic child may echo only the terminal fragment of a long expression. In English "I" regularly appears at the beginning of an expression as the subject. If you place the pronoun "I" at the end of an expression, an autistic child can echo it as easily as "you". Some people believe that the pronoun "I" is an index of self-identity and that autistic children lack a sense of self. From our experience I would say that autistic children make a

very clear distinction between self and non-self. They are in fact hyperautonomous, as anyone will find out when he tries to get the child to do something he does not want to do. Autistic children do not use "I" and "you" correctly because they are incognizant of a symbolic transformation rule necessary for the correct assignment and conversion of input pronouns. It is worth noting that even in normal children , "I" is never triggered by "you" but only by "me". [Fay,1969].

Returning from this digression on deixis, let me say something about our successes and our failures. Every treatment method reports its dramatic successes with one or two cases. What we need are long case series before we can compare methods and decide which is more effective relative to the effort required, that is, which is more efficient. Thus far our series of nonspeaking autistic children numbers 17 with 13 of the children improved. By improvement we mean only that the child begins voluntarily to use speech for social communication. We do not claim the method results in normal language ability with full comprehension, and correct articulation and grammar. Our aim is to kindle the child's interest in using speech, to get him to try again and again, to catalyze his damaged or slow-developing natural process of language acquisition.

We have tried the method with other types of nonspeaking children. We failed with two schizophrenic children. One brain damaged child improved and one did not. We failed completely with 3

children suffering from receptive aphasia. By failure we mean a child leaves us as he came, perhaps with some language understanding but producing no useful speech.

In studying our failures among the autistic group, we have tried to find some common denominator. We have found only two in our case series of 17 nonspeaking autistic children. First, each of these 3 failure cases were children who showed no interest in playing with the machine. Regardless of our coaxing and persuading they would have nothing to do with it. Finally, becoming desperate, we would be forced to violate one of our basic principles of allowing free play. We would spend weeks and months holding the child at the keyboard, pushing the keys for him, trying to overcome his resistance and negativism. But to no avail. Somehow we must be more ingenious in capturing these children's interest. We have thought of ways to do this and are currently trying to implement them.

Second, in cases where the child shows normal linguistic development until 16 or 22 months and then suddenly stops talking, we have failed absolutely. This history is suggestive of course of some type of cerebral insult such as a virus infection or auto-immune reaction, but these hypotheses remain unconfirmed.

Our non-random sample of 17 is too small to arrive at firm conclusions about the method. However our improvement ratio betters any reported in the literature. Some cautions are in order.

Language improvement represents only a first stop. These children still need a lot of help and have a long way to go to reach whatever is their potential.

Why haven't other workers tried this zero-risk and potentially promising method? Aside from the inertia which faces all new methods there are three reasons. One is that everyone has his own preferred method which he believes in and may wish to improve. The second involves people's beliefs and misconceptions about computers. I have come across people with the following fantasy about our situation -- that we have a small, cowering, bewildered child sitting in front of a towering bank of flashing lights (the New Yorker-cartoon concept of a computer) while cold scientists in white coats observe him through one-way mirrors. It is said "the child is already too interested in machines, he needs relations with people -- you are making him into even more of a robot". I hope from my brief description you can see this is a misconception of our situation. It may sound paradoxical, but some nonspeaking children can become more human, i.e. become a language user, by way of a machine which talks and which they find more acceptable on their own terms than they do talking humans.

A third objection to computers, and a more realistic one, is their cost. Few people in the world have access to million dollar computers for this sort of work. But a large computer is not necessary to carry out this method. Mini-computers costing only a

few thousand dollars are adequate. It may be that we do not need a computer at all if someone found a way to rapidly random-access both sounds and pictures. We are investigating this possibility. Once we can get the unnecessarily Satanic image of the computer out of the picture, I hope others will join us in discovering more about this technique for treating nonspeaking autistic children.

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